BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 344/89 - 3.3.2

Application No.: 83 104 853.3

Publication No.: 0 095 128

Title of invention: Coated composite silicon nitride cutting tools

Classification: C04B 41/87

D E C I S I O N
of 19 December 1991

Proprietor of the patent: GTE Laboratories Incorporated

Opponent: 01) Sandvik AB
02) Fried. Krupp GmbH

Headword: Cutting tool/GTE

EPC Article 56

Keyword: "Inventive step - no - obvious improvement"

Headnote

Case Number : T 344/89 - 3.3.2

D E C I S I O N
of the Technical Board of Appeal 3.3.2
of 19 December 1991

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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 23.03.89 revoking European patent No. 0 095 128 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : P.A.M. Lançon
Members : I.A. Holliday
R.L.J. Schulte

Summary of Facts and Submissions

I. European patent No. 0 095 128 concerning coated composite silicon nitride cutting tools and based on application No. 83 104 853.3 was granted on the basis of nine claims.

II. The two Respondents filed notices of opposition against the European patent. Five prior art documents were cited of which the following remain relevant in the present appeal:

(1) EP-A-0 035 777

(2a) JP-A-82 17466 (English translation)

(3) Chemical Abstracts, Vol 95, No. 846 559 (JP-A-81 16665)

III. The Opposition Division revoked the patent on the grounds of lack of inventive step. It was not disputed that the substrate body of the composite ceramic cutting tool was known from document (1). It was also known in the art that the wear resistance of cutting tools can be improved by coating with TiC. It was further known from both documents (2) and (3) that increased wear resistance can be obtained when silicon nitride based ceramic cutting tools are coated with TiC. It was accordingly the Opposition Division's view that, notwithstanding the comparative experiments which appear in the patent in suit, it would have been an obvious measure for the skilled person, seeking to improve the wear resistance of the cutting tools known from (1), to apply thereto a coating of TiC or TiCN and to arrive at the subject-matter of Claim 1 without involving an inventive step.

IV. The Appellant lodged an appeal against this decision which was supported by further comparative data which were reproductions of photographs illustrating scratch tests on TiC coated silicon nitride bodies. The purpose of the lists was to demonstrate that a TiC coating adhered better to silicon nitride composites which contained particulate TiC, i.e. the greater the proportion of TiC present in the composite, the higher the adhesion of the coating.

V. Respondent I repeated arguments advanced earlier that TiC had long been known as a desirable coating to improve the wear resistance of cutting tools, mentioning that it was first used in improving the life of cemented carbide cutting tools known in the late 60's. Since that time TiC had been the first choice of anyone skilled in the art seeking to improve the wear resistance of a cutting tool, regardless of the substrate thereof. Respondent I also argued (without mentioning any specific document) that cemented carbide substrates generally contain considerable quantities of TiC and further referred to document (2) in which some Si_3N_4-substrates contained TiC.

Respondent II argued that the wear properties of TiC had long been known, referring to "Technische Mitteilungen Krupp", Vol. 39, Nr. 1, pp. 13-22 (4) (published 1981) which had been cited during the examination and which is acknowledged in column 1 of the patent in suit. The Respondent questioned the relevance of the adhesion tests supplied by the Appellant. In addition it was pointed out that the arguments of the Appellant in respect of TiC did not seem to be pertinent to what was actually claimed in Claim 1, TiC being only mentioned in Claims 4 and 5. However, the Respondent argued that a combination of Claims 1 and 4 or 1 and 5 would also not be inventive in the light of the disclosures of documents 1 and 2. Respondent II also made a conditional request for oral proceedings.

VI. Claim 1, received in the EPO on 20 July 1988, on which this decision is based, reads as follows:

"1. A composite ceramic cutting tool comprising a TiC-containing composite silicon nitride substrate body consisting essentially of particles of a hard refractory material uniformly distributed in a matrix consisting essentially of a first phase of silicon nitride and a refractory second phase comprising silicon nitride and an effective amount of a densification aid selected from the metal oxide group consisting of yttrium oxide, zirconium oxide, hafnium oxide, the lanthanide rare earth oxide and mixtures thereof, characterised in that said substrate body has at least one coating layer consisting essentially of TiC or TiCN."

Dependent Claims 2 to 11 relate to preferred embodiments within the ambit of Claim 1.

VII. The Appellant requests that the decision of the Opposition Division be set aside and the patent maintained on the basis of Claim 1 filed on 20 July 1988 together with Claims 2 to 11 as granted.

The Respondents request that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. The current Claim 1 is formally allowable. It is based on Claims 1 and 5 as granted and also differs from the granted Claim 1 in that the reference to MgO as

densification aid has been deleted. It also finds support in Claims 1, 4, 6 and 12 of the originally filed disclosure. The requirements of Article 123(2) and 123(3) are accordingly satisfied.

3. None of the documents (1) to (3) nor any document cited in the course of the examination procedure discloses the specific combination of substrate and coating defined by Claim 1. The Board are thus satisfied that Claim 1 relates to novel subject-matter. In any event, novelty is no longer in dispute.

4. The patent in suit relates to a composite ceramic cutting tool. It was undisputed during the opposition procedure that the closest prior art is document (1); this view could be shared by the Board.

4.1 Document (1) discloses all the features of the pre-characterising part of Claim 1. In relation to (1), the problem to be solved is to improve the wear properties of the ceramic cutting tools known therefrom.

4.2 The problem is solved by applying to the substrate body at least one coating of titanium carbide or titanium carbonitride. Having regard to the comparative experiments appearing in the patent in suit and those supplied with the statement of appeal, the Board is satisfied that the problem has been solved.

5. It remains to consider whether or not the said solution satisfies the requirements of Article 56 EPC in respect of inventive step.

5.1 Document (2) also relates to ceramic cutting tools based on Si_3N_4. It is mentioned on page 2 (lines 21 to 22) of the English translation that abnormal wear or chipping

occurs in cutting steel owing to a reaction of iron with silicon. Accordingly a ceramic coating is recommended, TiC being mentioned among others on page 4 (lines 21 to 24). It is also to be noted that Example 3 of (2) includes TiC within the ceramic substrate of the tool, but without the claimed densification aids.

5.2 Respondent I has argued that TiC coatings have been widely used to improve the wear resistance of cemented carbide cutting tools since the late 60's; this was not disputed by the Appellant during oral proceedings before the Opposition Division. In fact, such a TiC coated cemented carbide tool is the basis of Curve D used as a comparison in the patent in suit. It is also evident from document (4) referred to by Respondent II that TiC coatings were known to improve the wear resistance of cutting tools having a variety of substrates. Further confirmation is provided by document (3) which also relates to substrates containing Si_3N_4.

5.3 As evidence in favour of a surprising effect, the Appellant has submitted with the grounds of appeal photographs showing that the TiC coating shows greater adhesion to Si_3N_4 substrates in proportion to the amount of TiC particles contained therein. In the opinion of the Board, this evidence is not relevant in respect of the wear resistance properties imparted by the TiC. Once a critical adhesion to the substrates has been attained, further increases in the adhesion of the coating would not be expected to influence the wear resistance. It is not excluded that a better wear resistance might be associated with a coating of lower adhesion.

5.3.1 It thus appears that the Appellant has attempted to change the nature of the invention by shifting the emphasis from improving the wear properties of the tool by applying a

coating to that of improving the adhesion of the said coating to the Si_3N_4 based substrate. Previous decisions of the Boards of Appeal have recognised that it is permissible to reformulate the problem to be solved, during the examination, opposition or appeal procedure, in the light of any prior art which may have arisen (e.g. T 01/80, OJ EPO 1981, 206; T 13/84, OJ EPO 1986, 253). However, having regard to the requirements of Article 123(2) EPC, such a reformulation could only be accepted if the new problem were foreshadowed in the originally filed application.

5.3.2 In the present case, the original application was so broadly formulated in that it related to a Si_3N_4 based substrate containing an (unspecified) refractory material in particulate form which was coated with a layer of (unspecified) refractory material. There is no mention in the original description (nor in that of the granted patent) of the adhesion of the coating to the substrate. Thus, in the light of the closest state of the art, the Board can concede neither that the objective technical problem to be solved lay in improving the adhesion of a TiC coating to a substrate based on Si_3N_4 nor that its solution lay in including TiC in the actual substrate.

5.4 Accordingly, the Board cannot accept the Appellant's submission that, since TiC is only one of a variety of coatings which might have been applied to a TiC containing Si_3N_4 based substrate, the surprising effect observed is evidence in favour of inventive step. It is clear from the preceding paragraphs that the properties of TiC coatings were well known at the priority date of the patent in suit. Thus, even if its wear resistance on application to a Si_3N_4 based substrate were superior to that achieved with other coatings known in the art, the choice of TiC must nevertheless be regarded as obvious, since the effect

observed would have been nothing more than might reasonably have been expected by one skilled in the art. The fact that the adhesion of the TiC layer to the Si_3N_4 based substrate was also improved could only be considered to be a bonus effect which would have inevitably resulted from the skilled person's non-inventive activity (c.f. decisions T 21/81, OJ EPO 1983, 15 and T 192/82, OJ EPO 1984, 415). The subject-matter of Claim 1 accordingly lacks inventive step.

5.5 Dependent Claims 2 to 9 which relate to preferred embodiments must fall with Claim 1.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar The Chairman

P. Martarona P.A.M. Lançon